

2022 Heliophysics Explorers Program (HE22) Small Explorer (SMEX) Evaluation Plan

Announcement of Opportunity
NNH22ZDA0160

November 29, 2022

Outline

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Introduction

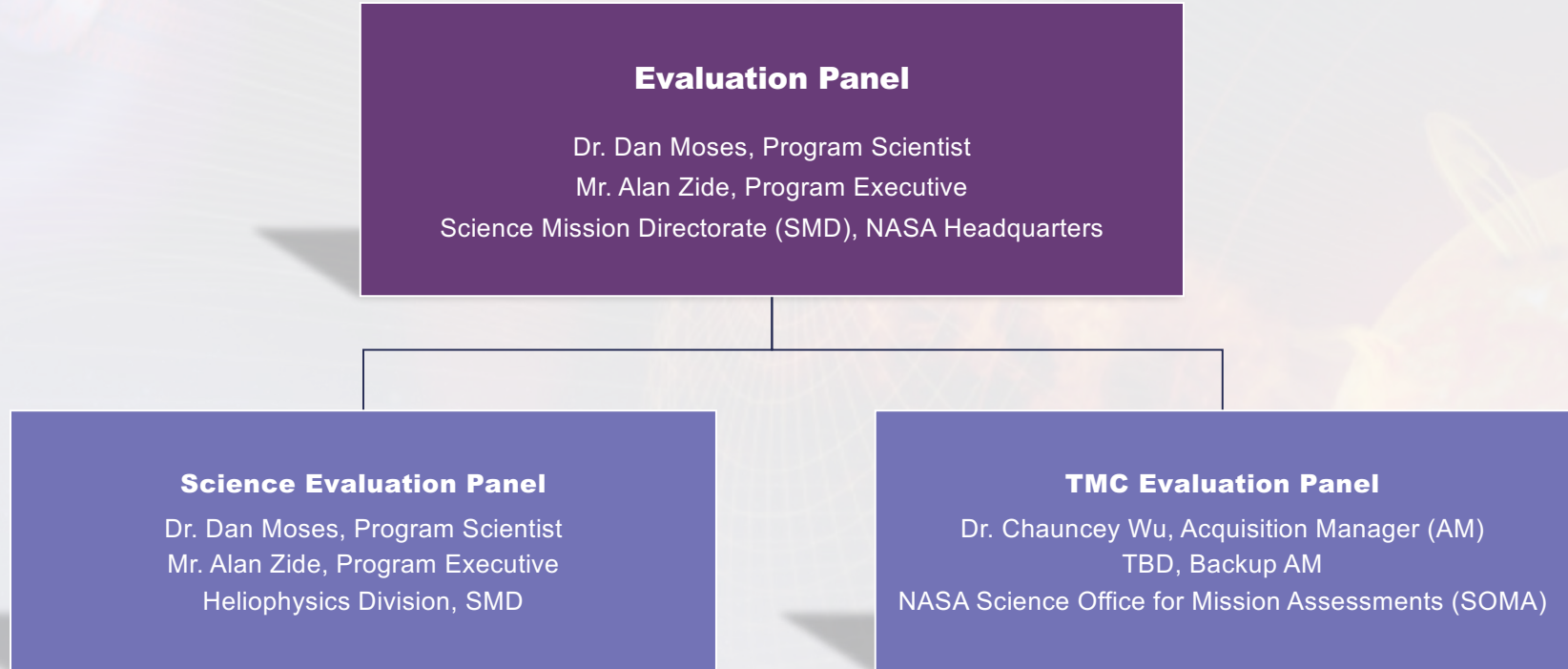
Introduction

- This 2022 Heliophysics Explorers Program (HE22) Small Explorer (SMEX) Evaluation Plan covers evaluation information from the Announcement of Opportunity (AO) and from the evaluation processes conducted by the Science Panel and the Technical Management and Cost (TMC) Panel.
- This SMEX AO solicits Complete Spaceflight Missions. The AO Cost Cap is \$150M in NASA Fiscal Year (FY) 2022 dollars, not including the cost of access to space or any contributions. Application of AO-specified incentives and/or charges may result in a proposal-specific Adjusted AO Cost Cap.
- This Evaluation Plan describes Step 1 of a two-step competitive process to down-selection for Phase B.
- The approval page for the Evaluation Plan is on page 56.

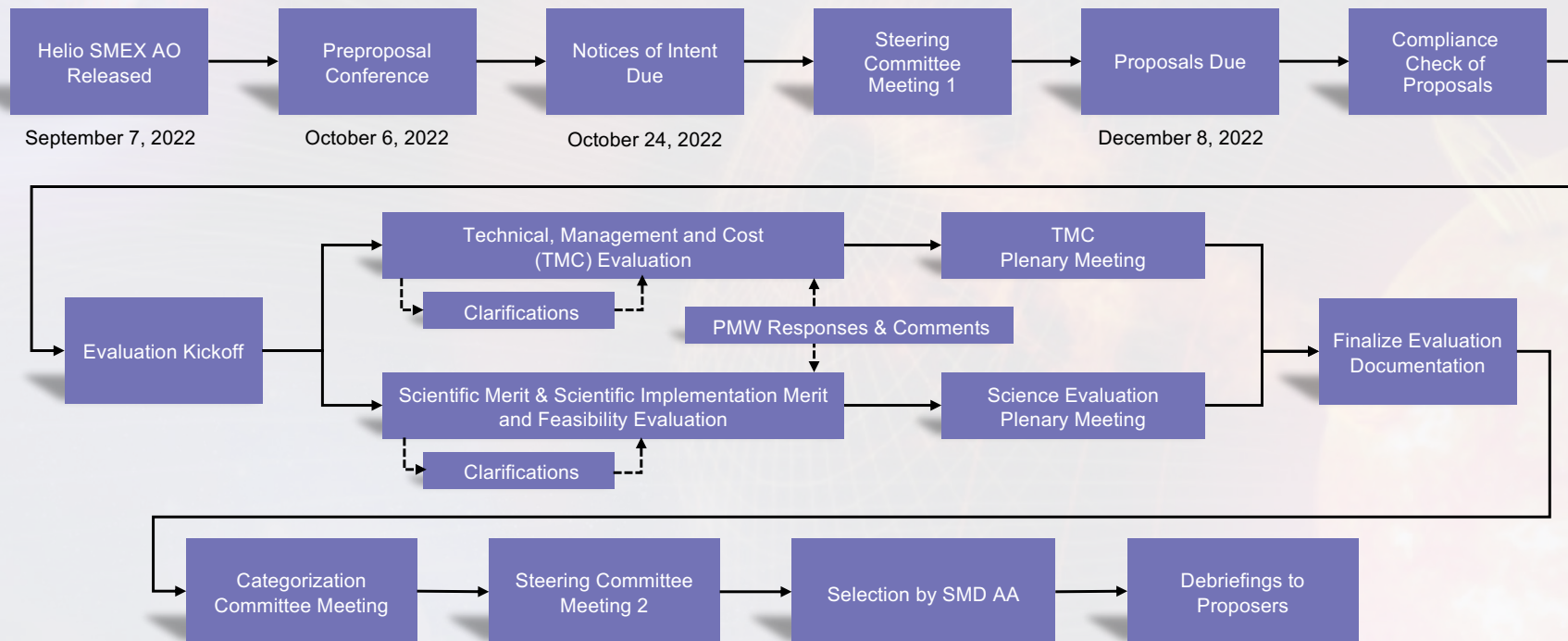
2022 Heliophysics Small Explorer Solicitation

- All investigations proposed in response to this solicitation must support the goals and objectives of the Heliophysics Explorers Program (Section 2), must be implemented by Principal Investigator (PI)-led investigation teams (Section 5.3.1), and must be implemented through the provision of complete spaceflight missions (Section 5.2.1).
- AO-provided access to space, where NASA is responsible for the mission's access to space, is offered under this AO. The following classes of platforms are offered under the AO-provided access to space.
 - Accommodation as a Venture-Class Acquisition of Dedicated and Rideshare (VADR) launch services Primary Payload(s) with capability to lift up to two 300 kg payloads, or one 910 kg payload, to a representative 500 km Sun-synchronous orbit. For other orbits, refer to the *Launch Services Program Information Summary* in the Program Library.
 - Accommodation as one or two Rideshare Payloads (RPLs) on a Secondary Payload Adapter (SPA) to representative LEO, GTO, or Cis-Lunar Space. Rideshare Payloads up to 220 kg on each of two ESPA Ports, or 465 kg on each of two ESPA Grande Ports, may be accommodated.
 - Complete spaceflight missions on the International Space Station (ISS).
- Cost requirements associated with AO-provided access to space are addressed in Section 5.9.2 of this AO.
- PI-provided access to space, where the investigation team takes responsibility for all of the mission's access to space, is permitted under this AO. For PI-provided access to space, only the aspects that are under the control of the PI will be evaluated.

Evaluation Organization



Proposal Evaluation Flow



AO Simplification

HE22 SMEX AO Simplification

Purpose of Simplification

- To reduce the workload on investigation teams generating Pre-Phase A proposals, NASA SMD has developed this solicitation with several requirements deferred to Step 2 (see Section 1.1 of the HE22 SMEX AO) and other requirements simplified. Proposal evaluators will be directed to perform the evaluation based on these requirement deferrals, simplifications, and page reductions.

Overall

- The page allocations have been reduced to reflect requirement deferrals and simplifications. These page reductions also take into account the recent change in format to 5.5 lines per vertical inch as stated in Requirement B-3 of Appendix B of the HE22 SMEX AO.

Investigation Implementation

AO Sections 5.2.2, and Appendix B, Section F.3.

- Systems Engineering: Requirement for a description of overall systems engineering approach eliminated; only the description of systems engineering aspects unique to the mission, if any, is required (Requirements 25 and B-38).
- Schedule: Two schedule foldouts do not count against the page limit instead of three; narrative for the schedule foldout is not required (Appendix B, p. B-2 and Section F.6).

HE22 SMEX AO Simplification

Management

AO Sections 5.2.2, 5.3.1 – 5.3.6, and Appendix B, Section G

- Requires only the management organization chart to be provided and the decision-making authority, and the teaming arrangement and responsibilities to be briefly discussed.
- Only mission-unique roles and responsibilities of the key management team are required. Eliminates explanation of traditional roles for key personnel.
- Defers naming the Project Manager (PM) and Project Systems Engineer (PSE) until Step 2.
- Project risk and potential mitigation strategies in the form of a table only.
- Requires waivers to NASA Procedural Requirements (NPRs) only to be listed. Eliminates need for a description.

Cost and Cost Estimating Methodology

AO Section 5.6.3, Requirements 69, B-49, and B-50.

- Requires a Basis of Estimate table and a brief description of the methodologies and assumptions used to develop the proposed cost estimate.
- Only requires a brief discussion of cost reserves.
- Only requires a brief discussion of cost risk.
- Eliminates presenting a rationale for the costing methodology.
- Eliminates description/evaluation of any independent cost estimates performed outside the proposing organizations.
- Eliminates description of cost management tools.

HE22 SMEX AO Simplification

Proposal Appendices

Appendix B, Section J, Requirements B-57 to B-59.

- Letters of commitment only required from (i) all organizations offering contributions of goods and/or services on a no-exchange-of-funds basis, collaborators excepted, and (ii) from the launch services provider for PI-provided access to space; but not including the institutions signing the NSPIRES Cover Page.
- Resumes – eliminates requirement for the resumes of the PM and PSE.
- Eliminates appendix for Summary of Proposed Program Cooperative Contributions.
- International Participation – reduced to a table and a brief, one-page narrative.
- Defers appendix for Discussion of Limiting the Generation of Orbital Debris and End of Mission Spacecraft Disposal Requirements.
- Heritage – reduced page count from 30 to 15 pages. This reduction also applies to the Classified Appendix Regarding Heritage.

Scientific/Technical Evaluation Factors

TMC Evaluation Criteria Updates – Rewording reflects simplified requirements. Refer to AO Section 7.2.4 and pages 35 to 37 of this Evaluation Plan.

Compliance Checklist, HE22 SMEX AO Appendix F

HE22 SMEX AO Compliance Checklist

HE22 SMEX Evaluation Plan

Administrative

1. Mandatory NOI submitted	Requirement 112
2. Electronic proposal received on time	Requirement 1
3. Augmented submission via the NASA Box service made on time.	Requirement 2
4. Original signatures of PI and of authorizing official included	Requirement B-12
5. Meets page limits	Requirement B-4
6. Meets general requirements for format and completeness, including maximum 5.5 lines per vertical inch (6.5 lines per 3 vertical centimeters), maximum 15 characters per horizontal inch (6 characters per horizontal centimeter), and 12-pt font for text and figure captions.	Requirement 113 Requirement B-1 Requirement B-2 Requirement B-3
7. Required appendices included; no additional appendices	Requirement B-54
8. Budgets are submitted in required formats	Requirement B-51
9. All individual team members who are named on the cover page indicate their commitment through NSPIRES	Requirement 90
10. All export-controlled information has been identified	Requirement 91
11. Restrictions Involving China acknowledged on Electronic Cover Page	Requirement 81

Scientific

12. Addresses solicited science research programs	Requirement 3
13. Requirements traceable from science to instruments to mission	Requirement 7
14. Appropriate data archiving plan	Requirement 8
15. Baseline science mission and threshold science mission defined	Requirement 10

Technical

16. Complete spaceflight mission (Phases A-F) proposed	Requirement 18
17. Team led by a single PI	Requirement 45
18. PIMMC within AO Cost Cap or Adjusted AO Cost Cap, as applicable	Requirement 64
19. Phase A costs within Phase A cost limit	Requirement 66
20. Contributions within contribution limit	Requirement 78
21. Co-investigator costs in budget	Requirement 57
22. Proposed launch readiness date prior to AO-required launch readiness date or proposed delivery readiness prior to AO-required delivery readiness date	Requirement 99
23. Includes table describing non-U.S. participation	Requirement 85
24. Includes letters of commitment from funding agencies for non-U.S. participating institutions	Requirement 84
25. Includes letters of commitment from all U.S. organizations offering contributions	Requirement 87
26. Includes letters of commitment from all major partners and non-U.S. institutions providing contribution of efforts of anyone on the Proposal Team.	Requirement 88

General Evaluation Requirements

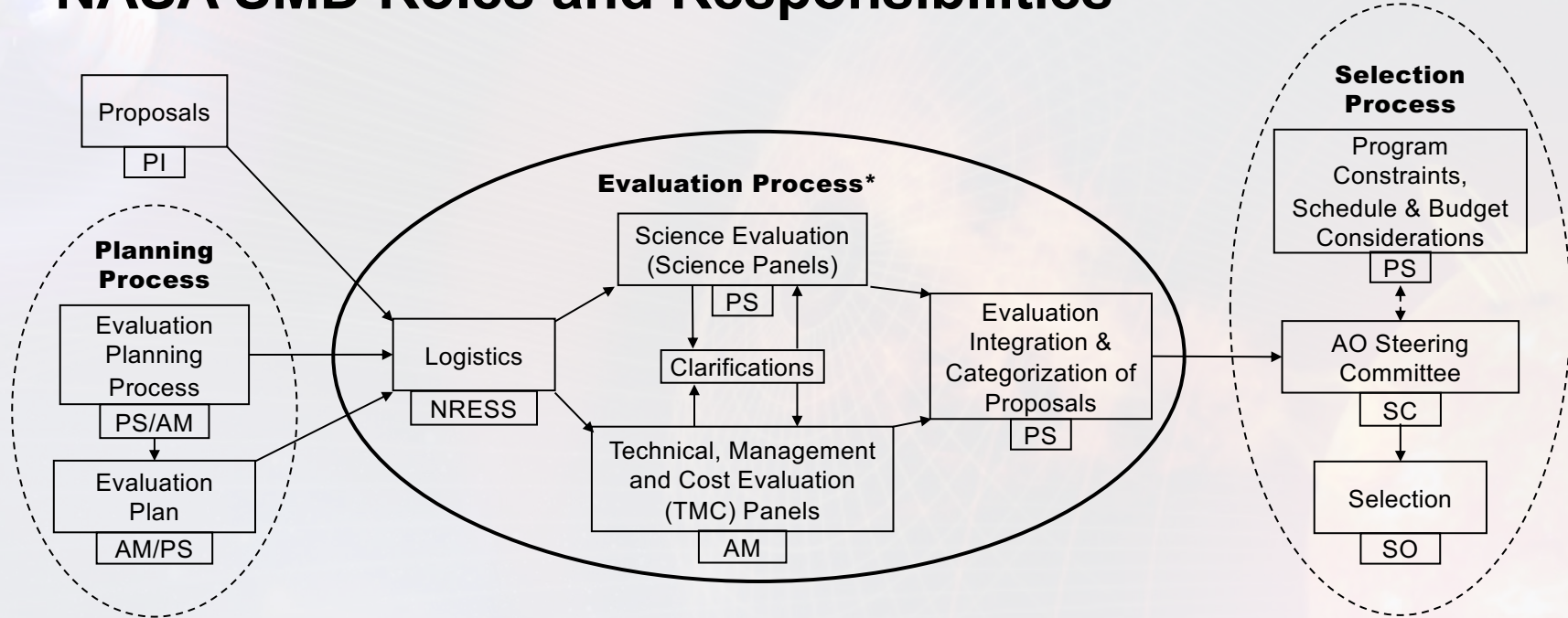
Principles for Evaluation

- All proposals are to be treated fairly and equally.
- Merit and Risk are to be assessed on the basis of the material in the proposal and the clarification process.
- Ratings shall reflect the written strengths and weaknesses.
- Everyone involved in the evaluation process is expected to act in an unbiased objective manner; advocacy for particular proposals is not appropriate.

General Evaluation Ground Rules

- All proposals will be evaluated to uniform standards established in the HE22 SMEX AO, and without comparison to other proposals.
- All evaluators will be experts in the areas that they evaluate.
- Specialist Evaluators (to provide special technical expertise to the TMC Panel) and non-panel/ mail-in Reviewers (to provide special science expertise to the Science Panels) may be utilized, respectively, based on need for expertise in a specific technology or science that is proposed.

NASA SMD Roles and Responsibilities



PI = Principal Investigator
 PS = Program Scientist
 AM = Acquisition Manager

NRESS = NASA Research and Education Support Services
 SC = AO Steering Committee Chair
 SO = Selecting Official

** The Evaluation Process is addressed in this document.*

Pre-Evaluation - Steering Committee Meeting 1

- As part of the Evaluation Planning Process, before the evaluation process begins, an AO Steering Committee will be convened. This Committee is composed of the SMD Deputy Associate Administrator for Research (DAAR) and a small number of SMD Program Scientists/Program Executives.
- The AO Steering Committee will conduct an independent assessment of the planned evaluation and associated processes regarding their compliance to established policies and practices, completeness, and self-consistency. They may provide recommendations to the Program Scientist and Acquisition Manager on potential adjustments to the evaluation team and the planned processes.

Conflicts of Interest (COI) Prevention and Mitigation Requirements

- The Science Panel members are on-boarded through NASA Research and Education Support Services (NRESS), and the non-Civil Servants are provided an honorarium for their participation. NRESS cross-checks all the Science Panel members against the lists of personnel and organizations identified in each proposal submitted to determine whether any organizational Conflict of Interest (COI) exists.
- The non-Civil Servants TMC Panel members will be hired as contractors through the NASA Science Office for Mission Assessments (SOMA) support contractor, Cornell Technical Services. CTS cross-checks all contracted TMC Panel members against the lists of personnel and organizations identified in each proposal submitted to determine whether any organizational COI exists.
- All contracted evaluators must divulge any other financial, professional, or potential personal COIs, and whether they work for a profit-making company that directly competes with any profit-making proposing organization.
- All Civil Service (CS) and Intergovernmental Personnel Act (IPA) evaluators must self-certify their COI status by reviewing a combined listing of individuals and organizations associated with the SMEX proposals.
- The TMC evaluators must notify the SOMA Acquisition Manager in case there is a potential conflict. The Science evaluators must notify the Program Scientist in case of a potential conflict.
- All known potential COI issues are documented, and a COI Mitigation Plan is developed to minimize the likelihood that an issue will arise in the evaluation process. Any potential COI issue is discussed with the Program Scientist and the SMD Deputy Associate Administrator for Research and documented in the COI Mitigation Plan. All determinations regarding possible COIs that arise will be logged as an appendix to the COI Mitigation Plan.
- If any previously unknown potential COI arises during the evaluation, the conflicted member(s) will be notified to stop evaluating proposals immediately, and the Panel Chair will be notified immediately. If a COI is confirmed, the conflicted member(s) will be immediately removed from the evaluation process, and steps will be taken expeditiously, to remove, mitigate, or accept any actual or potential bias imposed by the conflicted member(s). The steps will be documented in the COI Mitigation Plan.
- Members of the Science and TMC panels are prohibited from contacting anyone outside their panel for scientific/technical input, or consultation, without the prior approval of the Program Scientist.

Proprietary Data Protection Requirements

- All proposal and evaluation materials are considered proprietary.
- Viewing of proposal materials will be only on a need-to-know basis.
- Each non-CS or non-IPA evaluator will sign a Non-Disclosure Agreement (NDA) that must be on file at NRESS prior to any proposals being distributed to that evaluator. CS and IPA evaluators are under statutory obligations.
- The proposal materials that each evaluator has access to is documented.
- Evaluators are not permitted to discuss proposals with anyone outside their Science or TMC Panel.
- All proprietary information that must be exchanged between evaluators will be exchanged via the secure NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES), via the secure Remote Evaluation System (RES), via the secure NASA Box file exchange system, via secure WebEx, via NASA Google docs or via encrypted email, parcel post, fax, or regular mail.
- Web conferences or teleconferences among evaluators will be conducted via controlled Web conference and teleconference lines.
- Evaluators' electronic and paper evaluation materials will be deleted/destroyed when the evaluation process is complete. Archival copies will be maintained in the NASA SOMA vault.

Evaluation Criteria from HE22 SMEX AO:

- Scientific Merit of the Proposed Investigation (Section 7.2.2);
- Scientific Implementation Merit and Feasibility of the Proposed Investigation (Section 7.2.3);
- TMC Feasibility of the Proposed Mission Implementation, including Cost Risk (Section 7.2.4).

Weighting: the first criterion is weighted approximately 40%; the second and third criteria are weighted approximately 30% each.

Other Selection Factors (Section 7.3):

- Programmatic factors
- PI-Managed Mission Cost

Science Evaluation

Science Panel Composition and Organization

- The Program Scientist leads the Science Panel
- Science evaluators are typically, but not exclusively, recruited from the academic, governmental, and industrial research communities.
- The approach to evaluator identification is reviewed by the pre-evaluation Steering Committee convened by the DAAR (Steering Committee Meeting 1, page 13).
- The Science Panel evaluates Science Merit (Section 7.2.2 of the HE22 SMEX AO) and Scientific Implementation Merit and Feasibility (Section 7.2.3).
- The science evaluation will be conducted via a single Science Panel, however sub-panels may be employed, depending on the number and variety of proposed investigations.
 - Any sub-panel will be led by a NASA Civil Servant and may be co-chaired by a member from the scientific community.
 - Sub-panels may have an Executive Secretary.
- Each proposal will be reviewed by assigned panel members.
 - The Lead Reviewer for each proposal will lead the discussion. At least two secondary (supporting) reviewers will be assigned to each proposal.
 - At the request of the Lead Reviewer, a Supporting Reviewer will take notes on the discussion.
- The TMC Panel may provide comments and questions to the Science Panel, and vice versa.
- The Science Panel may request clarifications from proposers on any Potential Major Weaknesses (PMWs) in Science Merit (Form A) or Science Implementation Merit and Investigation Feasibility (Form B) that are identified during the evaluation process.

Science Panel Procedures

- The Science Panel will review a version of the proposal in which any export-controlled material has been redacted. Proposers are required to indicate such material; NRESS will redact the proposal PDF.
- Each Science Panel member evaluates proposals as directed by the Chair.
 - If special science expertise is required, the Science Panels may utilize non-panel/mail-in evaluators to assist with one or more proposals.
 - Non-panel/mail-in evaluators evaluate only those parts of proposals pertinent to their scientific specialties.
- Each proposal may be discussed by the evaluators in web conferences.
 - Findings in the form of Strengths and Weaknesses form the basis for initial panel discussions
 - Each assigned evaluator provides an individual evaluation prior to the web conferences.
 - The proposal and the individual evaluations are discussed at the web conferences, including those from non-panel evaluators.
 - The Lead Evaluator generates a Draft Evaluation including draft findings, based on the individual evaluations and the discussion. Draft findings include PMWs to be sent to the proposers for clarification.
 - After PMW clarification responses are received, a web conference is held to consider clarification responses. Draft findings are updated if applicable.
 - No overall merit grade is assigned at the web conferences.
- A Meeting of the Science Panel or sub-panels is held upon completion of individual evaluations for all proposals.
 - The Science Panel (or sub-panel) compiles all of the findings for each proposal.
 - If the sub-panels meet separately, a web conference of the sub-panel chairs, or of sub-panel members explicitly tasked with consistency, will review the draft findings of all sub-panels for consistency ahead of the sub-panel meetings.
 - For each proposal, the Chair or designated Lead Evaluator leads the discussion, summarizes the proposed investigation, and documents the results.
 - Evaluations of all proposals are reviewed during the Science Panel Meeting to ensure that standards have been applied uniformly and in an appropriate and fair manner.
 - After the discussion, each member of the Panel or sub-panel assigns a merit rating for Science (Form A) and for Science Implementation and Feasibility (Form B) to each proposal. Non-panel evaluators do not assign ratings.

Science Panel Evaluation Factors

Criterion A: Scientific Merit of the Proposed Investigation

Factors from HE22 SMEX AO Section 7.2.2

- Factor A-1. Compelling nature and scientific priority of the proposed investigation's science goals and objectives.
- Factor A-2. Programmatic value of the proposed investigation.
- Factor A-3. Likelihood of scientific success.
- Factor A-4. Scientific value of the Threshold Science Mission.

Factors A-1, A-2, and A-3 are evaluated for the Baseline Science Mission assuming it is implemented as proposed and achieves technical success. Factor A-4 is similarly evaluated for the Threshold Science Mission.

Evaluation Criterion A

- **Factor A-1. Compelling nature and scientific priority of the proposed investigation's science goals and objectives.** This factor includes the clarity of the goals and objectives; how well the goals and objectives reflect program, Agency, and national priorities; the potential scientific impact of the investigation on program, Agency, and national science objectives; and the potential for fundamental progress, as well as filling gaps in our knowledge relative to the current state of the art.
- **Factor A-2. Programmatic value of the proposed investigation.** This factor includes the unique value of the investigation to make scientific progress in the context of other ongoing and planned missions; the relationship to the other elements of NASA's science programs; how well the investigation may synergistically support ongoing or planned missions by NASA and other agencies; and the necessity for a space mission to realize the goals and objectives.
- **Factor A-3. Likelihood of scientific success.** This factor includes how well the anticipated measurements support the goals and objectives; the adequacy of the anticipated data to complete the investigation and meet the goals and objectives; and the appropriateness of the mission requirements for guiding development and ensuring scientific success.
- **Factor A-4. Scientific value of the Threshold Science Mission.** This factor includes the scientific value of the Threshold Science Mission using the standards in the first factor of this section and whether that value is sufficient to justify the proposed cost of the mission.

Science Panel Evaluation Factors

Criterion B: Scientific Implementation Merit and Feasibility of the Proposed Investigation

Factors from HE22 SMEX AO Section 7.2.3

- Factor B-1. Merit of the proposed mission architecture, instruments, and measurement techniques for addressing the goals and meeting the science objectives.
- Factor B-2. Programmatic value of the proposed investigation.
- Factor B-3. Likelihood of scientific success.
- Factor B-4. Scientific value of the Threshold Science Mission.
- Factor B-5. Probability of science team success.

The panel evaluating the “Science Implementation Merit and Feasibility” will evaluate the extent to which the proposed investigation provides career development opportunities to train the next generation of science leaders. The panel will also evaluate the Diversity and Inclusion Plan focusing on how executable and effective the Plan is expected to be. Additional reviewers with expertise in diversity and inclusion initiatives may also provide comments to NASA on the Diversity and Inclusion Plans.

Evaluation Criterion B

- **Factor B-1. Merit of the instruments and mission design for addressing the science goals and objectives.** This factor includes the degree to which the proposed mission will address the goals and objectives; the appropriateness of the selected instruments and mission design for addressing the goals and objectives; the degree to which the proposed instruments and mission can provide the necessary data; and the sufficiency of the data gathered to complete the scientific investigation.
- **Factor B-2. Probability of technical success.** This factor includes the maturity and technical readiness of the instruments or demonstration of a clear path to achieve necessary maturity; the adequacy of the plan to develop the instruments within the proposed cost and schedule; the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks; the likelihood of success in developing any new technology that represents an untested advance in the state of the art; the ability of the development team—both institutions and individuals—to successfully implement those plans; and the likelihood of success for both the development and the operation of the instruments within the mission design.
- **Factor B-3. Merit of the data analysis, data availability, and data archiving plan.** This factor includes the merit of plans for data analysis and data archiving to meet the goals and objectives of the investigation; to result in the publication of science discoveries in the professional literature; and to preserve data and analysis of value to the science community. Considerations in this factor include assessment of planning and budget adequacy and evidence of plans for well-documented, high-level data products and software usable to the entire science community; assessment of adequate resources for physical interpretation of data; reporting scientific results in the professional literature (e.g., refereed journals); and assessment of the proposed plan for the timely release of the data to the public domain for enlarging its science impact.

Evaluation Criterion B

- **Factor B-4. Science resiliency.** This factor includes both developmental and operational resiliency. Developmental resiliency includes the approach to descoping the Baseline Science Mission to the Threshold Science Mission in the event that development problems force reductions in scope. Operational resiliency includes the ability to withstand adverse circumstances, the capability to degrade gracefully, and the potential to recover from anomalies in flight.
- **Factor B-5. Probability of science team success.** This factor will be evaluated by assessing the experience, expertise, and organizational structure of the science team and the mission design in light of any proposed instruments. The scientific expertise of the PI will be evaluated but not their experience with NASA missions. The role of each Co-Investigator will be evaluated for necessary contributions to the proposed investigation; the inclusion of Co-Is who do not have a well-defined and appropriate role may be cause for downgrading during evaluation. The inclusion of career development opportunities to train the next generation of science leaders will also be evaluated. This evaluation factor also includes an evaluation of the Diversity and Inclusion Plan (see Requirement B-70). The Science Panel will evaluate the Diversity and Inclusion Plan focusing on how executable and effective the Plan is expected to be. Additional reviewers with expertise in diversity and inclusion initiatives may also provide comments to NASA on the Diversity and Inclusion Plans.

Science Evaluation Products

For each proposal, this process results in Form A and Form B, each of which includes

- Proposal title, PI name, and submitting organization;
- Proposal summary;
- Based on findings, adjectival median rating for Scientific Merit of the Proposed Investigation (Form A) and for Scientific Implementation Merit and Feasibility of the Proposed Investigation (Form B), ranging from “Excellent” to “Poor”*; half-grades (e.g., Very Good/Good) are not permitted during polling;
 - If the median rating falls between two grades (e.g., between Very Good and Good), the median rating will be stated as a mid-point between the grades (e.g., Very Good/Good)*;
- Summary rationale for the median rating;
- Narrative findings, identified as major or minor strengths or weaknesses;
- Comments to the Proposers, comments to the Selection Official*, and comments to the TMC Panel*.
(optional)

*** Note: not provided to proposers**

Science Evaluation Products: Findings

- **Major Strength:** A facet of the implementation response that is judged to be of superior merit and can substantially contribute to the ability of the project to meet its scientific objectives.
- **Major Weakness:** A deficiency or set of deficiencies taken together that are judged to substantially weaken the project's ability to meet its scientific objectives.
- **Minor Strength:** An aspect of the proposal that is judged to contribute to the ability of the project to meet its scientific objectives.
- **Minor Weakness:** A deficiency or set of deficiencies taken together that are judged to weaken the project's ability to meet its scientific objectives.

Note: Findings that are considered “as expected” are not documented on Forms A and B.

Form A and B Grade Definitions

- **Excellent:** A comprehensive, thorough, and compelling proposal of exceptional merit that fully responds to the objectives of the AO as documented by numerous and/or significant strengths and having no major weaknesses.
- **Very Good:** A fully competent proposal of very high merit that fully responds to the objectives of the AO, whose strengths fully outbalance any weaknesses.
- **Good:** A competent proposal that represents a credible response to the AO, having neither significant strengths nor weaknesses and/or whose strengths and weaknesses essentially balance.
- **Fair:** A proposal that provides a nominal response to the AO, but whose weaknesses outweigh any perceived strengths.
- **Poor:** A seriously flawed proposal having one or more major weaknesses (e.g., an inadequate or flawed plan of research or lack of focus on the objectives of the AO).

Note: Only Major Findings are considered in the adjectival rating.

TMC Evaluation

TMC Panel Composition and Organization

- The Acquisition Manager, who is a Civil Servant in the NASA Science Office for Mission Assessments (SOMA) at NASA Langley Research Center (LaRC), leads the TMC Panel.
 - NASA SOMA works directly for NASA Headquarters and is firewalled from the rest of NASA LaRC.
- TMC Panel evaluators are a mix of the best non-conflicted contractors, consultants, and Civil Servants who are experts in their respective fields.
 - Evaluators read their assigned proposals.
 - Evaluators provide findings on their assigned proposals.
 - Evaluators provide ratings of proposals that reflect findings.
- Additionally, Specialist Evaluators may be called upon in cases where technical expertise that is not represented on the panel is needed.
 - Specialist Evaluators evaluate only those parts of a proposal that are specific to their particular expertise.
 - Specialist Evaluators provide only findings; they do not provide ratings.

TMC Panel Evaluation Factors

Criterion C: TMC Feasibility of the Proposed Mission Implementation

Factors from HE22 SMEX AO Section 7.2.4

- Factor C-1. Adequacy and robustness of the instrument implementation plan.
- Factor C-2. Adequacy and robustness of the mission design and plan for mission operations.
- Factor C-3. Adequacy and robustness of the flight systems.
- Factor C-4. Adequacy and robustness of the management approach and schedule, including the capability of the management team.
- Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk.

The panel evaluating the third evaluation criterion, TMC Feasibility of the Proposed Investigation Implementation, will also provide comments to the Selection Official regarding the bulleted items below. While these comments will not be considered in the evaluation, they may be considered during selection.

- **The managerial and spaceflight experience of the PI, and whether appropriate mentoring and support tools are in place when necessary.**
- **The extent to which the proposed investigation provides career development opportunities to train the next generation of engineering and management leaders.**
- **The aspects of the PI-provided access to space not under the control of the PI.**
- **The availability of a rideshare to the proposed target orbit for investigations proposing AO-provided secondary launch services.**

Evaluation Criterion C

- **Factor C-1. Adequacy and robustness of the instrument implementation plan.** The maturity and technical readiness of the instrument complement will be assessed, as will the ability of the instruments to meet mission requirements. This factor includes an assessment of the instrument design, accommodation, interface, heritage, and technology readiness. This factor includes an assessment of the instrument hardware and software designs, heritage, and margins. This factor includes an assessment of the processes, products, and activities required to accomplish development and integration of the instrument complement. This factor also includes adequacy of the plans for instrument systems engineering and for dealing with environmental concerns. This factor includes an assessment of plans for the development and use of new instrument technology and plans for advanced engineering developments to mature systems within the proposed cost and schedule when systems having a TRL less than 6 are proposed, as applicable.
- **Factor C-2. Adequacy and robustness of the mission design and plan for mission operations.** This factor includes an assessment of the overall mission design and mission architecture, the spacecraft design and design margins (including margins for launch mass, delta-V, and propellant), the concept for mission operations (including communication), and the plans for launch services (for PI-provided access to space, only aspects that are under the control of the PI will be assessed under this factor). This factor includes mission resiliency—the flexibility to recover from problems during both development and operations—including the technical resource reserves and margins, system and subsystem redundancy, and reductions and other changes that can be implemented without impact to the Baseline Science Mission.

Note that ground systems and facilities will be evaluated at Step 2 under Factor C-7: see the Guidelines and Criteria for the Phase A Concept Study document, available in the Program Library.

Evaluation Criterion C

- **Factor C-3. Adequacy and robustness of the flight systems.** This factor includes an assessment of the flight hardware and software designs, heritage, and margins. This factor includes an assessment of the plans, products, and activities required to accomplish maturation, development, integration, and verification of all elements of the flight system. This factor includes an assessment of the adequacy of all elements of flight system resiliency, including flight software/hardware fault management, system and subsystem redundancy, and hardware reliability. This factor includes the plans for the development and use of new technology, plans for advanced engineering developments, and the adequacy of those plans to ensure success of the mission when systems having a TRL less than 6 are proposed. The maturity and technical readiness of the spacecraft and subsystems will be assessed.
- **Factor C-4. Adequacy and robustness of the management approach and schedule, including the capability of the management team.** This factor includes: the adequacy of the proposed organizational structure; the management approach including the roles; the commitment, qualifications, and experience of any named Key Management Team members, the implementing organization, and the known partners; the spaceflight experience of any named Key Management Team members (PI excepted); the implementing organization and known partners against the needs of the investigation; the prior working relationships of the implementing organization and known partners; the prior working relationships of the implementing organization and known partners; the commitments of partners and contributors; and the scope of work covering all elements of the mission, including contributions. Also evaluated under this factor is the adequacy of the proposed risk management approach, including any risk mitigation plans for new technologies, any long-lead items, and the adequacy and availability of any required manufacturing, test, or other facilities. The management of the risk of contributed critical goods and services will be assessed, including the plans for any international participation, the commitment of partners and contributors, as documented in Letters of Commitment, and the technical adequacy of contingency plans, where they exist, for coping with the failure of a proposed cooperative arrangement or contribution. This factor also includes assessment of elements such as the relationship of the work to the project schedule, the project element interdependencies, the associated schedule margins, and an assessment of the likelihood of meeting the proposed launch readiness or delivery readiness date. Also evaluated under this factor are the proposed project and schedule management tools to be used on the project.

Evaluation Criterion C

- **Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk.** This factor includes elements such as cost, cost risk, cost realism, and cost completeness including assessment of the basis of estimate, the adequacy of the approach used to develop the estimated cost, the discussion of cost risks, the adequacy and allocation of cost reserves by phase, and the scope of work (covering all elements of the mission, including contributions, and all elements associated with a PI-provided access to space [if applicable], such as launch site payload processing and mission unique services). The adequacy of the cost reserves and understanding of the cost risks—including those associated with PI-provided access to space associated delay and/or opportunity uncertainty—will be assessed. This factor also includes an assessment of the proposed cost relative to estimates generated by the evaluation team using parametric models and analogies.

TMC Cost Analysis

- The Evaluation assesses the cost risk, cost realism, and cost completeness including the basis of estimate, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks, the allocation of cost reserves by phase, and the proposal team's understanding of the scope of work.
- An independent cost verification of the proposed cost for Phases A-D is performed using at least two independent cost models.
- An independent cost verification of the proposed cost for Phase E is performed using at least two cost models.
- The likelihood and cost impact of Major Weaknesses are assessed.
- Cost threat impacts to the proposed unencumbered cost reserves are assessed.
- The adequacy of the remaining unencumbered cost reserves is assessed.
- All draft Forms C and Cost Evaluation Summaries (CESs) are completed prior to the Plenary Meeting.
- The entire TMC Evaluation Panel participates in the Cost deliberations.
- All information from the entire evaluation process is considered in the final cost assessment.
- All cost findings are included on the Form C and considered in the TMC Risk Rating.

Cost Threat Matrix

- The *likelihood* and *cost impact*, if any, of each weakness is stated as “This finding represents a cost threat assessed to have an Unlikely/Possible/Likely/Very Likely/Almost Certain likelihood of a Minimal/Limited/ Moderate/Significant/Very Significant cost impact being realized during development and/or operations, which results in a reduction from the proposed unencumbered reserves.”
- The *likelihood* is the probability range that the *cost impact* will materialize.
- The *cost impact* is the current best estimate of the range of costs to mitigate the threat.
- The cost threat matrix defines the adjectives that describe the *likelihood* and *cost impact*.
- The minimum cost threat threshold is \$1M for Phases B/C/D and \$250K for Phase E.

			Cost Impact (CI) % of PI-Managed Mission Cost to complete Phases B/C/D or % of Phase E not including unencumbered cost reserves or contributions				
	Likelihood of Occurrence	Weakness	Minimal \$1M < CI ≤ 5% \$0.25M < CI ≤ 5%	Limited 5% < CI ≤ 10% 5% < CI ≤ 10%	Moderate 10% < CI ≤ 15% 10% < CI ≤ 15%	Significant 15% < CI ≤ 20% 15% < CI ≤ 20%	Very Significant CI > 20% CI > 20%
Likelihood (L, %)	Almost Certain (L > 80%)						
	Very Likely (60% < L ≤ 80%)						
	Likely (40% < L ≤ 60%)						
	Possible (20% < L ≤ 40%)						
	Unlikely (L ≤ 20%)						

Note: For each proposal, the percentages in the above table will be converted to dollars by the cost estimator depending on the proposed PIMMC.

Ground Systems and Facilities

- Evaluation Factor C-2 is amended to delete the evaluation of “ground systems and facilities.” Ground systems and facilities are evaluated during Step 2 under Factor C-7.
 - Ground systems and facilities in AO Requirements B-27 and B-37 will not be evaluated under Factor C-2. However, information on ground systems and facilities relevant to factors other than Factor C-2 will be evaluated.
 - Although ground systems and facilities are not evaluated under Factor C-2, associated schedule and cost impacts shall be included in the Step-1 proposals. See AO Requirement B-42 for schedule and Requirement B-48 for cost of the ground systems and facilities.

Student Collaboration (SC), Technology Demonstration Opportunities (TDOs), and Science Enhancement Options (SEOs)

- Definition and evaluation of SCs, TDOs, and SEOs are deferred to Step 2.
- All requirements associated with SCs (AO Section 5.5.2), TDOs (AO Section 5.2.3), and SEOs (AO Section 5.1.8) are deferred until Step 2.

Citizen Science (CS) (Optional)

- Requirement 60. If a Citizen Science component is proposed as part of the baseline science, the CS component shall be described and the cost included in the PI-Managed Mission Cost.

TMC Panel Product: Form C

For each proposal, the TMC Evaluation will result in a Form C for Categorization, Steering, and Selection that contains:

- Proposal title, PI name, and submitting organization;
- Based on the findings, an adjectival median risk rating for the TMC Feasibility of the Proposed Mission Implementation of “Low Risk,” “Medium Risk,” or “High Risk”;
- Summary rationale for the median risk rating;
- Narrative findings, identified as major or minor strengths or weaknesses;
- Optional comments to the Proposers, Selection Official*, and Science Panel*.

*** Note: not provided to proposers**

TMC Evaluation Products: Findings

- **Major Strength:** A facet of the implementation response that is judged to be well above expectations and can substantially contribute to the ability of the project to meet its technical requirements on schedule and within cost.
- **Major Weakness:** A deficiency or set of deficiencies taken together that are judged to substantially weaken the project's ability to meet its technical objectives on schedule and within cost.
- **Minor Strength:** A strength that is worthy of note and can be brought to the attention of Proposers during debriefings, but is not a discriminator in the assessment of risk.
- **Minor Weakness:** A weakness that is sufficiently worrisome to note and can be brought to the attention of Proposers during debriefings, but is not a discriminator in the assessment of risk.

Note: Findings that are considered “as expected” are not documented on the Form C.

TMC Risk Rating Definitions

Based on the narrative findings, each proposal will be assigned one of three risk ratings, defined as follows:

- **Low Risk:** There are no problems evident in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the proposer's capability to accomplish the investigation well within the available resources.
- **Medium Risk:** Problems have been identified, but are considered within the proposal team's capabilities to correct within available resources with good management and application of effective engineering resources. Investigation design may be complex and resources tight.
- **High Risk:** One or more problems are of sufficient magnitude and complexity as to be deemed unsolvable within the available resources

Note: Only Major findings are considered in the risk rating.

PMW Clarifications Process

PMW Clarifications Process is Modified from Previous AOs

Section 7.1.1 of the AO states "Proposers should be aware that, during the proposal evaluation and selection process, NASA may request clarification of specific points in a proposal; if so, such a request from NASA and the proposer's response must be in writing. In particular, before finalizing the evaluation of the *Scientific Merit of the Proposed Investigation* (see Section 7.2.2), the *Scientific Implementation Merit and Feasibility of the Proposed Investigation* (see Section 7.2.3), and, the *TMC Feasibility of the Proposed Mission Implementation* (see Section 7.2.4), NASA will request clarification on specific, Potential Major Weaknesses (PMWs) in these criteria that have been identified in the proposal.

NASA will request clarification in a uniform manner from all proposers. Proposers will be allowed up to **eight combined pages** in total (with some restrictions) for clarifications of the PMWs associated with the *Scientific Merit of the Proposed Investigation* (A-Factors) plus the *Scientific Implementation Merit and Feasibility of the Proposed Investigation* (B-Factors) evaluation criteria. Up to **six pages** in total (with some restrictions) will be allowed for clarifications of the PMWs associated with the *TMC Feasibility of the Proposed Investigation Implementation* (C-Factors) evaluation criterion. These clarifications may include text, tables, and figures to address the PMWs and to provide additional information. The requirements and constraints of the clarification process will be addressed in the Preproposal Conference and the *2022 Heliophysics Small Explorer Evaluation Plan* found in the 2022 Heliophysics Explorers Acquisition Homepage."

PIs whose proposals have no PMWs will be informed that no PMWs have been identified (note Requirement 7 on page 47 discusses the provision of additional information within the 8 combined pages allowed for Factors A & B, and 6 pages allowed for Factor C).

TMC PMW clarification responses relevant to the Science evaluation are provided to the Science panel. Science PMW clarification responses relevant to the TMC evaluation are provided to the TMC panel. Only the PMW clarification responses (not the PMWs) are provided to the other panel.

PMWs Clarification Process Requirements

(1 of 3)

Clarifications Responses must conform to the following requirements:

- Requirement 1:** Proposers shall submit only one Clarification Response Document that addresses each PMW for the combined A- and B-Factors. Proposers shall submit only one Clarification Response Document that addresses each PMW for the C-Factors.
- Requirement 2:** The Clarification Response Documents shall be a single unlocked (e.g., without digital signatures), searchable Adobe Portable Document Format (PDF) file, composed of the response text, figures, and/or tables. Images (e.g., figures and scans) shall be converted into machine-encoded text using optical character recognition. Animations shall not be included. Links to materials outside of the response are not permitted. Do not insert any comment fields.
- Requirement 3:** The Clarification Response Documents shall be presented in 8.5 x 11 inch paper (or A4) format. Text shall not exceed 5.5 lines per vertical inch and page numbers shall be specified. Margins at the top, both sides, and bottom of each page shall be no less than 1 inch if formatted for 8.5 x 11 inch paper; or no less than 2.5 cm at the top and both sides, and 4 cm at the bottom if formatted for A4 paper. Type fonts for text, tables, and figure captions shall be no smaller than 12-point (i.e., no more than 15 characters per horizontal inch; six characters per horizontal centimeter). Fonts used within figures shall be no smaller than 8-point.
- Requirement 4:** For the combined A- and B-Factors PMWs, the Clarification Response Documents shall not exceed eight pages. For the C-Factor PMWs, the Clarification Response Documents shall not exceed six pages. Text, table(s) and figure(s) are permitted; however, all material shall be within the page limits specified above and limitations in Requirements 2, 3 and 9. Response files shall not exceed 10MB each.

PMWs Clarification Process Requirements

(2 of 3)

- Requirement 5:** The Clarification Response Documents shall not contain International Traffic in Arms Regulations (ITAR), Export Administration Regulations (EAR), or classified material.
- Requirement 6:** Each PMW shall be addressed, and each clarification response labelled, with the PMW number provided. Each PMW clarification response shall contain only information specific to the PMW. Although your clarification response may point back to references in your proposal, please note that there are already references to locations on your proposal with the PMWs, which indicates that the evaluation team is familiar with and has already evaluated that data, therefore they are not obliged to re-consider them. When making references to the material in your proposal in your clarification responses, refer to the proposal page number on the bottom of the page, as opposed to the electronic PDF file page number.
- Requirement 7:** In the Clarification Response Document, the proposers are free to provide any additional information on any criteria or requirements relevant to the proposed investigation (e.g. for TMC Feasibility of the Proposed Investigation Implementation, advances in proposed technologies since proposal submission). However, this response together with the PMW clarification responses shall not exceed the total page limitation per Clarification Response Document.
- Requirement 8:** In addition to the references in the proposal, in support of each PMW clarification response, proposers may provide up to two references; references are restricted to peer-reviewed literature. In support of any additional information response in Requirement 7, proposers may provide up to two additional references; references are restricted to peer-reviewed literature. References with a publication or release date after the proposal due date are allowed. Proposers shall not provide URLs with any of the responses.

PMWs Clarification Process Requirements (3 of 3)

Requirement 9: Proposers may append to the page-limited response complete versions of a modified Science Traceability Matrix (STM; Table B1, HE22 SMEX AO), Mission Traceability Matrix (MTM; Table B2, HE22 SMEX AO), Total Mission Cost Profile table (Table B3b, HE22 SMEX AO), Master Equipment List (MEL; Table B5, HE22 SMEX AO), and/or schedule foldout (Requirement B-42 of the HE22 SMEX AO). These modified fold-out(s)/table(s) shall have modifications clearly marked by the use of a different color font or by a colored-bordered box (labeled “PMW Clarification”). Proposers shall provide the description of the updates and changes to the modified fold-out(s)/table(s) as text in the page limited document. The complete versions of the modified STM, MTM, Total Mission Cost Profile table, MEL and schedule will not count against the page limit. Any new or other fold-out(s) will count as two pages against the response page limit.

Categorization

Categorization Process and Proposal Categories

Subsequent to the evaluation process, NASA will convene a Categorization Committee, composed wholly of CS and IPA appointees (some of whom may be from Government agencies other than NASA) and appointed by the Associate Administrator for the Science Mission Directorate. The Categorization Committee will consider the Scientific Merit, Scientific Implementation Merit and Feasibility, and TMC Feasibility of the Proposed Mission Implementation and, based on the evaluations, categorize the proposals in accordance with procedures required by NFS 1872.404. The categories are defined in NFS 1872.404(k) as follows:

- Category I.** Well-conceived, meritorious, and feasible investigations pertinent to the goals of the program and the AO's objectives and offered by a competent investigator from an institution capable of supplying the necessary support to ensure that any essential flight hardware or other support can be delivered on time and that data can be properly reduced, analyzed, interpreted, and published in a reasonable time. Investigations in Category I are recommended for acceptance and normally will be displaced only by other Category I investigations.
- Category II.** Well-conceived, meritorious, and feasible investigations that are recommended for acceptance, but at a lower priority than Category I, whatever the reason.
- Category III.** Meritorious investigations that require further development. Category III investigations may be funded for further development and may be reconsidered at a later time for the same or other opportunities.
- Category IV.** Proposed investigations which are recommended for rejection for the particular opportunity under consideration, whatever the reason.

Steering and Selection

Steering and Selection Process

Steering

NASA will convene a Steering Committee, composed wholly of CS and IPA appointees (some of whom may be from Government agencies other than NASA), appointed by the Associate Administrator for the Science Mission Directorate. The Steering Committee will then review the results of the evaluations and categorizations. The Steering Committee will conduct an independent assessment of the evaluation and categorization processes regarding their compliance to established policies and practices, as well as the completeness, self-consistency, and adequacy of all supporting materials.

Selection Process

After the review by the Steering Committee, the final evaluation results will be presented to the Associate Administrator for the Science Mission Directorate, who will make the final selection(s). As the Selection Official, the SMD Associate Administrator may consult with senior members of SMD and the Agency concerning the selections.

The results of the proposal evaluations based on the criteria and the categorizations will be considered in the selection process. Additional selection factors are described in AO Section 7.3.

As part of the selection process, a decision will be made as to whether or not any Category III proposals will receive funding for technology development.

Observers

Observers Approval and Compliance

Under special circumstances, Civil Servants, IPAs, and/or contractors with downstream implementation responsibilities may be invited to participate as observers to panel meetings.

- Observer participation must be approved by the Program Scientist and the Deputy Associate Administrator for Research.
- Observers must comply with SMD Policy Document SPD-17, Statement of Policy on Observers at Panel Reviews of Proposals. This policy is provided to all approved observers who have implementation responsibilities.

Approved Observers (this list will be updated as Observers are approved)

- Nicholas Chrissotimos, EHPD, NASA/GSFC
- Mark Goans, EHPD, NASA/GSFC
- Catherine Peddie, EHPD, NASA/GSFC
- Michael Delmont, EHPD, NASA/GSFC
- Joseph Burt, EHPD, NASA/GSFC
- Christine Hinkle, EHPD, NASA/GSFC
- Sherrie Wood, EHPD, NASA/GSFC
- Carla Connor, EHPD, NASA/GSFC

Approval

Approval

Chauncey Wu
Acquisition Manager
Science Office for Mission Assessments

Dan Moses
Program Scientist
Heliophysics Division, SMD

Alan Zide
Program Executive
Heliophysics Division, SMD

Cindy Daniels
Director
Science Office for Mission Assessments

Nicola Fox
Director
Heliophysics Division, SMD

Michael New
Deputy Associate Administrator for Research
SMD

Change Log

Revision #	Date	Change

